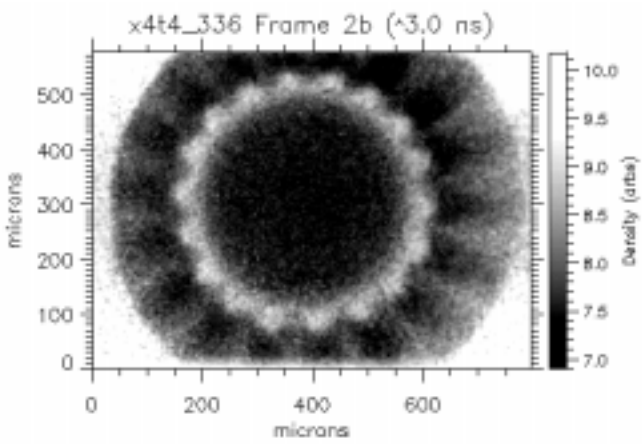
July 1998 Progress Report

LALP 98-69

Target Physics

Direct Drive Cylindrical Hydrodynamic Experiments

A team of researchers from P, X, and MST Divisions conducted the second week of Direct Drive Cylindrical Implosions at the OMEGA Laser Facility of the Laboratory for Laser Energetics at the University of Rochester on July 20-24, 1998. The primary goal of the campaign was to obtain ablative Rayleigh-Taylor growth in convergent geometry for a selection of mode numbers and amplitudes. The principal design effort was led by David Tubbs, X-TA, and documented in a preshot report XTA-RN(U)98-028. Cris Barnes and Bob Watt, P-24, led the experimental effort that resulted in 35 shots in the three extended-shift days of operation, including 32 targets fabricated by the MST-6 and 7 team that recently wor a LANL Large Team Distinguished Performance Award for their work on this and other ICF campaigns. The significant effort at data analysis and simulation of the multiple modes is now beginning. The secondary goal of improving the data for quantitative radiography analysis was also achieved, with shots that characterized the backlighter, x-ray cameras, and target opacity. Finally, some new initiatives were tried to help guide future design. Neutrons were observed in implosions on deuterated $C_{0.5}D_{0.37}H_{0.13}$ foam, although at low levels. Perturbations were also tried on the *inside* of the marker layer, resulting in strong "feed-out" of the perturbations to the ablation surface (see figure above of an initial m=18, 1.5 μm amplitude sinusoidal perturbation on the inside at the marker-foam interface).



Diagnostic Development

Omega Streaked Optical Pyrometer and Neutron Bangtime Diagnostics

The Diagnostic Engineering and Operations team led by John Oertel, P-24, recently completed preparations for two diagnostics to be installed on the Omega laser facility later this summer. The first instrument under construction for Omega is a telescope intended to measure hohlraum temperatures by temporal and spatial measurement of shock breakout. The telescope, configured in a Streaked Optical Pyrometer (SOP) mode, consists of a chamber-insertable cassigrain telescope, external-focusing optics, large format streak camera, and CCD camera. The telescope mirrors were designed, constructed, and tested in the P-24 Optical Fabrication Laboratory while all other mechanical parts were built in the P-Division machine shop. The Hamamatsu large format streak camera was tested and characterized at the Trident laser facility utilizing Trident's unique UV picosecond capability. The other diagnostic to be fielded at Omega is a neutron bangtime detector. The bangtime instrument has all the computer controls completed and the reentrant tube in place. Final construction of the coupling between gated microchannel plate and scintillator is due to be completed this month. Both of these diagnostics are due to be in place for the ID4 experiments scheduled for the week of August 31, 1998.

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